Incorporating "The Illuminating Engineer."

Light and Lighting

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Principal Contents:

I.E.S. Special Sections

IT was a somewhat bold departure of the Illuminating Engineering Society to start four Special Sections.

It seems evident that the experiment has been a success. Sectional gatherings provide an admirable contrast to the more formal general meetings. This was admirably illustrated by the three last events concerned with decorative lighting, public lighting and industrial lighting. At the first two there were large and keen audiences to hear the addresses of Mr. Penwarden and Mr. Elford; the third meeting, devoted to a racy discussion of special industrial lighting problems, was of a cheerful, indeed, one might say festive, character.

Already the three Sections named have gathered quite a considerable body of adherents from outside, from whom additional members of the Society will doubtless be gained. As might be expected the Photometry Section relies mainly on I.E.S. members for attendance at its more technical discussions, which have been of a high standard. Two contributions deemed worthy of publication in the Transactions have already been produced.

All sections will doubtless continue to develop, and new ones may still be formed. They have been very fortunate in their Chairmen and the experiment of the decentralisation of work through their respective secretaries has answered well. Progress will involve additional work. We should like to hear of other keen young members of the Society able and willing to bear a hand.

Public Lighting in Wandsworth—"Amusement Lighting"—The World Power Conference—Must Films be Shown in Darkness?—I.E.S. Meetings—Science and Industry—Sodium Lighting in Bolton—The "Glass Age" Exhibition Train

Public Lighting in Wandsworth

A somewhat new method was followed by the Public Lighting Section of the Illuminating Engineering Society on February 18, when Mr. Ernest J. Elford gave an address on "The Re-Lighting of a Borough." Prior to the meeting members were given an opportunity to wander about the streets of Wandsworth and study for themselves salient features of the lighting. This is really the only satisfactory way of studying street lighting installations which can scarcely be examined in detail during a circular tour by motor coach. The notice of the meeting circulated to members contained both a plan of the locality and lighting data for the main streets concerned, previously compiled by Mr. Elford. Following this initial inspection visitors were entertained to light refreshments in the municipal buildings, after which Mr. Elford gave his address. There was a keen and interesting informal discussion, over which Mr. F. C. Smith presided. Many knotty points were raised, and the fact that many of those who spoke had previously studied the streets and the methods of lighting was of evident benefit.

"Amusement Lighting"

For want of a better term we may adopt this description of the varied lighting problems recently discussed by Mr. A. Edgar, electrical engineer to Belle Vue (Manchester, Ltd.), at a recent meeting of the North Western Area Local Centre of the Illuminating Engineering Society. We hope shortly to give a fuller illustrated account of this paper, which dealt with a series of problems not often treated in detail, and quite distinct from those met with in the theatre and cinema. Amongst the problems considered were the lighting of circuses, ice spectacles, boxing, and wrestling rings, speedways, ballrooms, promenades and large open areas given up to firework displays—all forms of entertainment with which the owners of moderately sized amusement parks may have to deal. The lavish permanent equipment of a theatre is rarely available and some ingenuity must often be exercised in order to get the right effect. In many cases the needs of performers and public, which must both be met, differ considerably, and both may alter according to circumstances—it makes quite a difference, for example, if aerial acts (trapese work, etc.) are put on for a circus, and the treatment of an ice spectacle needs to be carefully adjusted to the nature of a show. It was interesting, in this connection, to learn that white lighting is rarely used for an ice show as the effect is considered too "hard."

The World Power Conference

At the coming World Power Conference, to be held in Vienna during August 25 to September 2, there will be several papers by British authors dealing with lighting. Amongst these are Street Lighting in Great Britain (Dr. H. F. Gillbe, Ministry of Transport), Electric Lighting for Streets and Transport (Mr. W. J. Jones, E.L.M.A. Lighting Service Bureau), and "Public Lighting by Gas" (W. J. G. Davey and A. R. McGibbon, Joint Lighting Committee, Institution of Gas Engineers and Society of British Gas Industries). It will be seen, therefore, that in this case the claims of the rival illuminants are nicely adjusted, and, generally speaking, this applies to other sections where papers reviewing the possibilities of gas and electricity, and in some cases oil or solid fuels, are to be found.

Programmes and membership application forms may be obtained from the British National Committee, World Power Conference, Kingsway, London, W.C.2.

Must Films be Shown in Darkness?

It is some time since we referred to this problem, which bears on the work of one of the I.E.S. Committees. We expressed the belief then that the appearance of films would be enhanced and in no way spoiled by permitting moderate illumination in the auditorium and aiming at lighter surroundings to the screen. This is borne out by a recent article in the "Evening News" by A. Jympson Harman, who describes experiments in the Odeon Theatre at Leicester Square. There was, apparently, general agreement that a neutral grey surround to the screen improved the effect of the colour film then being shown. As the author put it, "Our eyes began to be strained by the brilliance of the film as one usually sees it" immediately the usual black surround was restored. Doubtless the same principle applies to films in general.

I. E. S. Meetings.

LONDON.

Mar. 4th. Discussion reviewing **Technical Aspects of the Final Report of the Ministry of Transport Committee on Street Lighting,** to be opened by Mr. G. S. LUCAS and Mr. A. R. MCGIBBON (Public Lighting Section of the Illuminating Engineering Society), *(Watson House, Townmead Road, Fulham, S.W.6)*; **6.30 p.m.**

Mar. 15th. Annual Dinner of the Illuminating Engineering Society at the Trocadero Restaurant, Piccadilly, W.1; **6.45** for **7.30 p.m.**

Mar. 22nd. MISS EDNA MOSELEY on **How I Would Plan the Lighting of a Home** (Decorative Lighting Section of the Illuminating Engineering Society), *(Gas Industry House, 1, Grosvenor Place, London, S.W.1)*; **6.30 p.m.**

Mar. 29th. A Discussion on **The New Factory Act** in relation to Industrial Lighting (Industrial Lighting Section of the Illuminating Engineering Society), *(Home Office Industrial Museum, Horseferry Road, London, S.W.1)*; **6.30 p.m.**

April 5th. A Paper dealing with **Telephotometry** (Photometry Section of the Illuminating Engineering Society), at the *Westminster Technical Institute*; **6.30 p.m.**

April 12th. Mr. J. W. RYDE on **Fluorescence Powders and their Applications to Sources of Light** (General Meeting of the Illuminating Engineering Society), *(Institution of Mechanical Engineers, Storey's Gate, St. James's Park, London, S.W.1)*; **6.30 p.m.**

April 29th. Discussion on **Glassware in Relation to Decorative Lighting** to be opened by Mr. OLIVER P. BERNARD and Dr. W. M. HAMPTON (Decorative Lighting Section of the Illuminating Engineering Society), *(Lecture Theatre of Holophane, Ltd., Elverton Street, Vincent Square, London, S.W.1)*; **6.30 p.m.**

MANCHESTER.

Mar. 28th. Mr. J. W. HOWELL on **Colliery Lighting** (North-Western Area Local Centre of the Illuminating Engineering Society), *(Engineers' Club, Albert Square, Manchester)*; **7.15 p.m.**

LEEDS.

Mar. 21st. Annual Meeting and Dinner of North Midland Centre of the Illuminating Engineering Society at the *Gt. Northern Station Hotel, Leeds*; **7.30** for **8 p.m.**

GLASGOW.

Mar. 2nd. Mr. H. E. DE WEERDT on **Automatic Control of Illumination** (Scottish Local Centre of the Illuminating Engineering Society), *("The Gordon," 19, Gordon Street, Glasgow)*; **7.30 p.m.**

DUBLIN.

April 5th. Mr. R. O. ACKERLEY on **The Application of Electric Discharge Lighting to Industry** (I.F.S. Local Centre of the Illuminating Engineering Society), *(Engineers' Hall, 35, Dawson Street, Dublin)*; **8 p.m.**

Science and Industry

The annual report of the Department of Scientific and Industrial Research records progress in practically all directions. It is satisfactory to note the important part played by the research associations for the various industries. The aggregate income subscribed by industry has now practically reached £250,000, and the Government's grants to nearly half that sum. Of interest to readers is the research at the N.P.L., mentioned in our last issue, designed to test the ease with which objects in a street can be detected by light of different colours, such as those furnished by the mercury and sodium discharge lamps. Allied to the problem of street lighting are the investigations of various road surfaces. The Non-Ferrous Metals Research Association has been very active, one matter receiving attention being the principles underlying the production of mirror-bright deposits of nickel that do not require polishing. New buildings, including 10-20,000 sq. ft. of laboratory accommodation, are being erected by the Association in London.

Sodium Lighting in Bolton

Although there has been for some time a considerable amount of sodium lighting in Bolton, the Corporation has recently undertaken large extensions. In the Chorley Road 150 watt "Philora" sodium

lamps, installed in Revo fittings, are spaced forty-two yards apart and mounted twenty-four feet high, and similar methods are adopted in the Manchester Road, illustrated above. These installations were designed and erected under the supervision of Mr. H. Hamer, the Corporation lighting engincer.

The "Glass Age" Exhibition Train

Londoners had recently an opportunity of inspecting the "Glass Age" Exhibition Train, equipped by Pilkington Brothers, Ltd., which is now touring the country, and was stationed in Victoria Station for several days. The train was divided into ten sections, in which a most effective demonstration of modern glass equipment was staged. In the entrance was arranged an illuminated table, and above it an odd lighting fitting based on the use of glass ribbon strips. Subsequently, there were a model bathroom, a cocktail bar, a rotunda, and other sections given up to rolled and wired glass, decorative glasses for illumination, displays of glass floor tiles, etc. Some of the decorative designs were most ingenious —one recalls an illuminated screen composed of glass rolling pins—and the colours of the glass panelling, such as the steel blue polished plate used in the rotunda, were, in some cases, very pleasing. In the bathroom and kitchen the general use of vitrolite opaque glass, etc., seemed quite natural and appropriate. In many rooms such materials must be used with discretion, but there is no doubt that they have great possibilities.

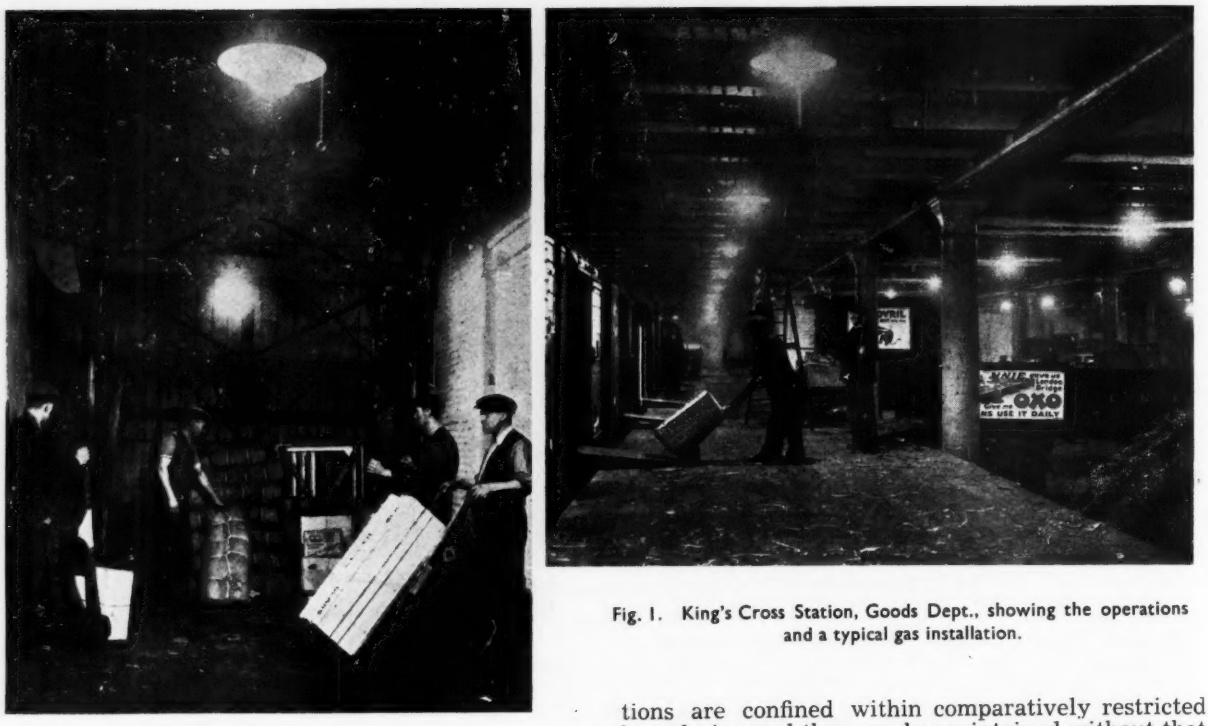


Fig. 1. King's Cross Station, Goods Dept., showing the operations and a typical gas installation.

Railway Lighting

by

M. G. BENNETT, M.Sc., F.Inst.P.
(London, Midland & Scottish Railway).

Introduction.

In this paper only lighting which is peculiar to railways is dealt with; thus, in describing the lighting of passenger stations, only the platform lighting will be considered, as the waiting rooms and offices present no problems not encountered elsewhere in lighting practice. For the same reason foundries and works and typing bureaux, etc., are not mentioned. The problems that remain are of considerable practical and theoretical interest.

It is not perhaps realised by many that a very large proportion of railway work is done at night. The ordinary passenger does not see the work which goes on throughout the night in goods sheds and marshalling yards, many of which are as busy at night as during the day. Good lighting has, therefore, an important part to play in facilitating railway operation.

As often as not the railway engineer is required to improve the lighting at yards and stations which were not planned for modern traffic, and which, also, differ widely in design. It is, therefore, impossible to apply rigid standards. Nevertheless, as a result of experience, certain general principles have evolved which are illustrated in this paper.

Modern lighting fittings with a high degree of control of the light rays have been of the greatest assistance in solving the wide range of difficult problems encountered, and have facilitated the reduction of glare and the proper utilisation of reflection and of contrast, which are the constant aims of the illuminating engineer.

There is an important difference between lighting on the railway and in such places as streets and manufacturing works. In the latter cases the installations are confined within comparatively restricted boundaries, and they can be maintained without that loss of time in travelling which is inevitable on a railway. Maintenance costs, therefore, form a relatively big proportion of the total lighting costs of a railway, and it is of the greatest importance that fittings shall remain reasonably efficient with the minimum of skilled attention. This, and the necessity for reliability, are points which I desire particularly to impress upon members of the society, because they are matters the importance of which is not realised by the designers of many fittings which are submitted to the railways.

Goods Depots.

To cover the whole gamut of railway lighting and to appreciate the importance of the various items it will, perhaps, be convenient to follow first a consignment and then a passenger from the beginning to the end of a journey. Take first the consignment, which is collected by a van and taken to the depot. At the depot we first meet a problem peculiar, if not exclusive, to the railways. It is usual for the vans to be backed up against a deck where the consignments are unloaded and segregated according to destination, the consignments then being taken on barrows to the trains for the different destinations. Lighting is wanted inside the vans, on the decks, and in the rail vans so that they can be loaded properly. Apart from the general considerations of glare, etc., which apply to all lighting problems, a peculiar feature of deck lighting is that illumination on the floor is not the only thing which counts in reading labels, but good illumination is needed on all planes. A number of practical difficulties also usually arise from low roofs, obstructions due to cranes, etc., and these cases usually resolve themselves into a matter of exercising as much ingenuity as possible in placing the lamps to give as even a distribution of light as possible. To avoid glare, deep shades are very largely used so that it is impossible to see the bare sources of light unless one is nearly under the lamp, when the source is out of the way of the normal direction of vision. It is not usual to employ enclosed opal units to avoid glare because of the cost and the difficulty of maintenance. An example is shown in Fig. 1.

To light into the road and rail vans experiments have been made with lamps attached to flexible arms

or suspended from conductor wires along the edge of the deck, which could be put inside the van when it is being loaded or unloaded, but no such device has yet been successful. Any such contrivance is liable to be badly knocked about by men carrying loads on their backs and in other ways. It has, therefore, become the practice to rely on the general lighting of the deck to throw some light into the vans, and one railway definitely regulates the height of the lamps in relation to their distances back from the deck-edge so that the shadow of the top of the doors of the van shall not come below 3 ft. from the floor of the vans on the back wall. The general illumination on the deck may, in these cases, be of the order of 4 foot-candles under the lamps, 2 foot-candles between them, and 1 foot-candle at the deck-edge.

The consignment may, of course, have been loaded direct from a road van into a rail van in the open, and here again the problem of lighting into vans arises, with the added difficulty of there being no roof from which to hang the lamps. Lamp-posts are objectionable, in that they tend to obstruct the movements of the road vans. It is sometimes possible to hang lamps from long cantilevers reaching over the rail vans from the far side, so that the support of the cantilever is out of the way of the carts, but floodlighting also is often used.

Goods Yards.

The wagons having been loaded, they are drawn out of the shed and marshalled into trains for different destinations, which often means transferring wagons from one line to another by means of turntables and using capstans and ropes. In many goods yards there is a whole row of these turntables and capstans, and during rush hours there is very intensive work, requiring the best possible lighting. The men require to see to hook the ropes on and off the undercarriages of the wagons, to see when to stop the movement of the turntables, and to gauge the speed of movement of the wagons on the roads. The safety of the men is greatly enhanced by good lighting, but the lighting must be done with the minimum number of sources, as each source means a lamp-post, which itself constitutes an obstruction and a danger. To avoid obstruction, lamps have, in some cases, been suspended from overhead catenary wire systems, but such installations are expensive and the layout of many yards does not permit of their use.

It might seem that the obvious solution is floodlighting, but there are objections, as well as advantages, in this. Firstly, it must be appreciated that on many occasions there are wagons standing close together on adjacent roads, and unless there is a floodlight to illuminate up and down between each pair of roads there would be dangerous shadows, and the number of roads may be large. Floodlighting from the boundary of the yard would be quite useless because of the shadows. Secondly, floodlights are not as useful as local lights in fog. This is a point which will be developed in more detail later.

It is important that the undercarriages of the wagons should be seen clearly when they are near the turntables to facilitate hooking on and off of the capstan ropes. It is also important that capstans and points levers should be seen clearly. For these purposes, one railway has developed a sunk fitting to give a local flooding effect without causing obstruction.

These yards are most difficult to lay down standards for, since no two are alike in layout or method of operation. Each case has to be studied separately After the lighting engineer has watched the operations for some time, he usually finds that by some combination of flood- and local-lights he can provide illumination where it is needed.

Marshalling Yards.

The train having been marshalled, it proceeds on its journey. It may proceed to a marshalling yard, where the wagons are re-sorted, along with those from other trains, into new trains for the final destinations. Marshalling yards can be divided into four main types, namely, hump, flat, gravity, and mechanical. These are similar in principle and differ only in the form of the motive power used for moving the wagons. Fundamentally, the method of working these yards is to cut the incoming trains into the wagons for different destinations and then to collect all the wagons from the different incoming trains destined for the same place into one road, so that new trains for the different destinations can be made up. To do this, the yard is laid out with a large number of sidings all converging on to one bottle-neck. Each siding is used for the collection of the wagons for one destination. The wagons of the incoming trains are propelled through the bottle-neck and can be diverted into their appropriate sidings by manipulation of the points.

In a hump yard the bottle-neck is elevated on a hump. The incoming train is pushed over this hump and the wagons run down by gravity into the appropriate sidings. The points are manipulated by men stationed in the yard, who have to be able to see clearly the wagons as they run down the hump and the numbers which are chalked on their fronts to indicate the roads into which they have to be diverted. The speed with which the wagons run down the hump must be controlled according to how far the wagons must be run into the sidings. For this purpose a number of men are stationed in the yard to apply the brakes when necessary. In a gravity yard the movements are similar, but the whole of the yard is on a gentle slope, so that the wagons will, if not braked, run down to the far end of the sidings. In a flat yard the wagons are pushed into their appropriate sidings with an engine, and the driver gauges how much impetus to give to the wagons to send them as far as may be desired into the siding.

It will be seen that with these three types of yard it is essential that the men shall be able to see clearly in both directions, at any rate until the wagons have gone some way into the sidings, otherwise wagons may be switched into wrong sidings and have to be withdrawn and re-sorted, and work generally is slowed up. It is particularly desirable that glare shall be reduced, as none of the surfaces in the field of vision can be given a great brightness, so that even a small amount of glare has a very adverse effect. The units of light must, therefore, be either high or in deep shades to prevent rays coming out at small angles to the horizontal. As in the case of goods yards, here also it is desirable to reduce obstructions in the form of lamp-posts. It is also particularly desirable that the chalked numbers on the fronts of the wagons should be very clearly seen, and special lighting is usually provided for this purpose, sometimes in the form of spotlights thrown on to the fronts of the wagons, but these are not always possible because in some situations they are rather glaring to the men on the hump when looking towards the sidings.

The operation of a mechanised yard is rather different. The bottle-neck is on a hump, as in the hump yard, but the setting of points and the control of the speed of the wagons is done from a central control tower, and there are practically no men in the yard. Information as to the roads into which the different wagons have to be set is given by a man at the hump by telephone or message to the central control tower. The speeds of the wagons are regulated by mechanical retarders on the rails operated from this central point. Thus, the essential thing in this yard is to provide

Fig. 2. Hull Yard and Control Tower, lighted mainly by electric floodlights.

good visibility for the men in the control tower, which is usually elevated some 20 ft. or 30 ft. in the air so that the viewpoint is entirely different from the previous cases, and an entirely different type of lighting is permissible.

Were it not for the difficulty of fog, floodlighting at a big height would be the ideal solution in all these cases, and in some yards on the Continent and elsewhere, not subject to much fog, this type of lighting has been installed with great success. It is quite common in France and Germany to see marshalling yards lit with batteries of floodlights mounted on lattice towers some 100 ft. high, and very good, even illumination without glare and with the minimum of obstruction is achieved. In this country, however, fog is comparatively frequent, and the disorganisation which it can produce is a very serious matter. In fog, the light from high floodlights has to traverse a greater distance of obscuring atmosphere before it reaches the ground than the light from local lights. The attenuation increases rapidly with the distance traversed, the law being exponential, and even a light fog can render floodlights useless when local lights remain comparatively effective. Even when the fog is so dense that local lights do not provide any sensible illumination in the ordinary sense of the word, they act as beacons with the help of which the men can find their way about. These arguments do not mean that floodlighting has no place in yard lighting on British railways. Indeed, floodlighting is the only possible method of illumination in some cases, particularly where the clearance between the rails is so small that it would be dangerous to install lamp-posts for local lighting; but floodlighting is not the panacea that it would at first sight seem.

For the above reasons, floodlighting is often unavoidable, and in order to see whether it cannot be made more useful in fog, experiments are being tried at a yard at Crewe with a device for lowering the lamps to half-height during fog. In this position the lamps would not, of course, cover the area for which they are designed, but, nevertheless, they might prove to be more useful than if left at their normal height.

Fig. 4. Mottram Yard, a well spaced local lighting installation using electric "P.L.A." fittings.

Wagons in a yard are usually seen as dark objects against the faintly illuminated background of the yard itself and against the sheen on the rails. In this respect yard lighting is similar to street lighting and any improvement in contrast which can be obtained is specially valuable. In a yard at Hull, Fig. 2, the metalling of the permanent way is done in white stone, whereas the rest of the yard is of black cinders. The contrast reveals the track to the man in the control tower and enhances the visibility of the wagons. A similar effect has been obtained experimentally at a yard at Nuneaton where the wagons run for part of the way near to a brick wall. Whitewashing this wall had a marked effect.

Such, briefly, are the considerations and limitations controlling the design of lighting installations for marshalling yards. Three examples, of rather different design, but each well suited to its particular environment, are shown in illustrations. At the mechanised yard at Hull (Fig. 2) the lighting is mainly by floodlights arranged to give maximum visibility from the control tower, and the yard is very clearly seen from this position.

A compromise between floodlighting and local lighting, which has been found suitable in a number of non-mechanised yards, is shown in the picture of Corby (Fig. 3). Here the main part of the lighting is done with Sugg's "London" lamps at about 120 ft.

Fig. 3. Corby and Weldon Sidings, lighted by gas lamps, and a compromise between flood and local lighting.

spacing and 25 ft. high. A good spread of light is obtained without an unduly large number of posts, and the sources do not prove, in practice, to be intrinsically so bright as to produce objectionable glare.

Finally, the lighting of Mottram Yard is shown in Fig. 4, where deep "P.L.A." fittings project all the light on to the ground at steep angles and glare is at a minimum. It is not always that the layout of the yards will permit the post positions necessary for this type of lighting, but when it is possible the result is good, as the photograph shows.

Signal Boxes.

During the transit of trains, signal boxes are passed. The lighting of these is of interest. It must be remembered that the signal man has not only to be able to see his lever frame, instruments, and train record book, but he has also to keep an eye on the signals under his control and on the head- and tail-lights of passing trains. In order that he shall be able to see out of his box clearly most railways provide only subdued lighting inside, and carefully

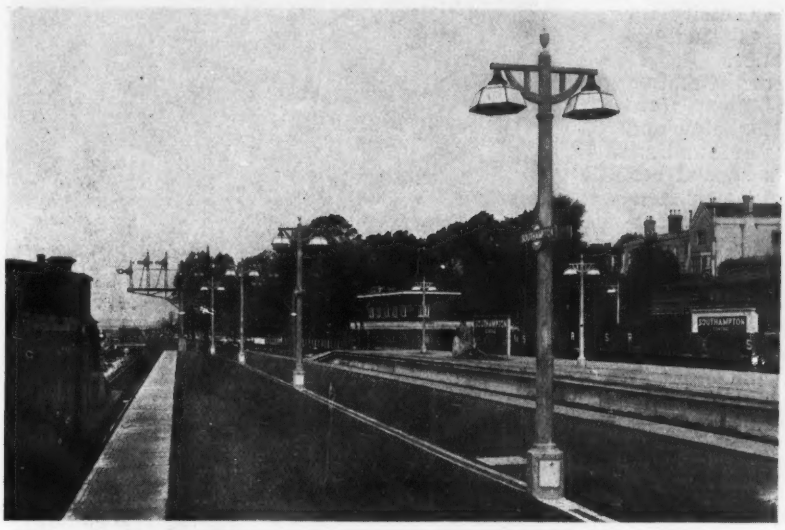


Fig. 5. Southampton Station, showing typical modern station fittings.

screen it so that it shines only where it is wanted. This is one of the few cases that exist in lighting practice where a little illumination is definitely better than a lot, and a proper control of it is required

Carriage Depots.

Let us consider now the case of a passenger. In the first place, the train has to be cleaned and equipped. This may be done in a shed or out of doors. In a shed the lighting presents no special difficulties, but is more difficult out of doors, where there is no roof from which lamps can be suspended. Floodlighting is sometimes resorted to, or the lamps are suspended from an overhead catenary wire system, and fittings of the Rodalux type used to throw the light up and down the gangway between the coaches. It is common to adopt one or other of these systems, or a modification of them, to avoid obstruction due to lamp-posts, the clearance between the coaches usually being small.

Passenger Stations.

The train is now brought to the departure station platform, and it is assumed that the passenger is standing on the platform waiting for it. He naturally wishes to be able to read the paper, and parcels have to be loaded into the train, for which purpose labels have to be read. At the same time, it is desirable to be able to see the whole length of the platform. In the latter respect the problem is similar to street lighting, with the complication that illumination on all planes for "local" visibility is required, as well as "long distance" visibility. Essential features such as signs, platform numbers, direction posts, and the edges of the platforms must be well lit, and there are also, of course, the psychological and aesthetic points of view to be considered.

At one time it was not unusual to use shades of the inverted cone type, with the lamp projecting below. These fittings gave a misleading appearance of brilliance to the stations, for the bare sources of light attracted the eye, but the glare from them made the actual visibility very poor, and there was, of course, considerable wastage of light upwards. The next step was to instal deep, opaque reflectors, generally of enamelled iron, to concentrate the light downwards and reduce glare. Considerable improvement in visibility was thus obtained, but, as might have been expected, the general effect was rather deadening, for no light at all was thrown upwards, and the roofs of the stations were in complete darkness. It has now become fairly general practice to use shades of opal glass, of which an example is shown in Fig. 5. The efficiency of these in practice is probably not much less than that of enamel reflectors, and yet they throw some light upwards to reveal faintly the roofs of the stations and give a general impression of spaciousness. The opal panels of these shades are illuminated just enough to give a general impression of brightness without glare, and in appearance they are not unpleasing where it is not desired to make a special feature of the lighting. A night view of an installation of these fittings at Broad-street is shown in Fig. 6.

The spacing and height of the fittings is arranged to give a reasonably uniform distribution of light, the S/H ratio being usually 4 or 5 to 1. The intensity varies with the circumstances and the importance of the station, a typical value being, say, 100 candle-power for every 30 ft. of platform under the awning where people congregate and somewhat less outside, again according to the circumstances. It is difficult to be more explicit when attempting to deal comprehensively with stations ranging from termini such as King's Cross and Euston, which themselves differ widely, down to country halts.

At some of the newer or reconditioned stations there is a movement to get away from standard unimaginative lighting and produce something which is aesthetically more pleasing and harmonious with the architecture, and yet not less efficient. Enclosed flush fittings have been installed in some cases, as at the new station at Leeds. An example of valance lighting, at Upminster Bridge, is show in Fig. 7. The

Fig. 7. Upminster Bridge Station. A special case with garage G.E.C. fittings from the valance of the awning. Wet platform.

Fig. 6. Broad Street Station. A night view showing the effect of the type of fitting shown in Fig. 5.

newer forms of lighting obviate the necessity for additional fittings for special purposes such as placards and give a "cleaner" appearance.

It is the practice to display the name of the station on platform lamps. Each railway has its own form of nameplate, which is usually fixed a little below and behind the lamp so as to receive good illumination. One railway has, however, developed a special box type opal glass fitting with the station name stencilled on the side, and this has a very good appearance without giving appreciable glare.

Passenger Coaches.

The passenger having boarded the train, he becomes concerned with the lighting of the train itself. There is a severe restriction on the amount of light that it is possible to provide on steam lines, due to the fact that the electricity has to be generated from the axle, and the load has to be carried by batteries when the carriage is stationary. In spite of these difficulties, however, illuminations as high as 6 or 7 foot-candles are common in some of the latest stock. In some carriages the maximum possible use is made of the wattage available by providing shoulder lights to bring the source near the objects to be viewed. While this certainly increases the illumination, the lamps are at the same time brought rather near the line of vision of the passengers sitting opposite, who consequently suffer a certain amount of glare. As to whether it is better to have shoulder lights or to have all the lighting in the ceiling is a matter of opinion upon which passengers are not unanimous, and the practice varies between the railway companies.

Motive Power Depots.

Before either passenger or goods trains are made up the engines must be prepared in the motive power depots. The lighting of the shops and offices here present no peculiar problem, but special lighting is needed in the shed where the engines are examined and cleaned and minor repairs done. Illumination is required all round and over the engines, and a typical installation consists of 100 candle-power lamps between the roads at about 30 ft. spacing and 12 ft. height. For examination of the engines from below, pit lights of a type similar to those adopted in garages are often installed, but it is usually necessary to provide portable hand-lamps as well to throw light on to the more inaccessible parts. The yard outside the shed is a problem similar in a general way to that of a goods yard, but special lighting has to be provided for mechanical coaling plants, ash plants and water columns, etc. It will be appreciated that maintenance is a particularly important matter of these premises, and nothing but the most robust fittings which can be easily cleaned are possible.

Illuminants.

So much for the lighting of particular types of premises. As to illuminants, both gas and electricity are, of course, very widely used. Electric discharge lamp lighting has not as yet been adopted to any great extent. Its use may extend; but that it has disadvantages for certain railway purposes cannot be denied. The difficulty of distinguishing the colours of labels and tickets is very real, and it would be a doubtful policy for a railway company to cause its passengers to appear in any but the most prepossessing light. The new type of discharge lamp which has recently appeared on the market, which is surrounded with fluorescent powder, may do something to overcome this difficulty, and discharge lamps can, of course, be combined with filament lamps, as has been done at Fenchurch Street Station.

There are many railway stations with no supply of either gas or electricity, and oil is then usually used. Incandescent mantles are rapidly replacing the old wick lamps, and an example of this, at Challow Station, is shown in Fig 8. The light output of these lamps is such that very few fittings are required, one or two usually sufficing for most country platforms. Shades of different shape are available, by which the distribution of the light can be controlled according to circumstances.

Fig. 8. Challow Station. A typical case of incandescent mantle oil lighting with Tilley lamps.

Acknowledgments.

The assistance of the Southern, London and North Eastern, and Great Western Railways in the compilation of this paper is gratefully acknowledged, as is also the help of Mr. G. D. Winslow in obtaining a number of the photographs. For permission to reproduce Figs. 1 and 5 the writer is indebted to "The Railway Gazette," and for Fig. 8 to Messrs. Tilley Lamp Company, to each of whom thanks are accorded.

Discussion.

The paper gave rise to a keen discussion. Amongst those who took part were Mr. P. S. Barton, Mr. J. Bateman, Mr. J. S. Dow, Mr. G. W. Golds, Mr. A. R. McGibbon, Mr. C. A. Morton, Mr. J. S. Preston, and Mr. F. C. Smith. A number of interesting points were raised, many of them common to the lighting of streets and railway areas. The old question of the importance of vertical illumination (for example in examining the backs of vehicles in shunting yards), and the expediency of specifying illumination in a vertical plane was raised. The arrangement of lights above platforms was shown to be a problem not unlike the illumination of certain types of roads, several speakers laying stress on the desirability of keeping all sources screened from view so that one had an unfettered view of the entire length of the platform. The desirable height of lamps on high posts for the floodlighting of railway yards was discussed. It was pointed out that misty nights are by no means a rarity and that atmospheric absorption, always variable and often considerable, may be accentuated on railway systems by the presence of smoke. As regards maintenance problems, emphasis was placed on the need for robust fittings which would stand up to hard service. It was asked whether railway companies had any recognised system of renewing electric lamps, whether, for instance, all could be renewed after a given period of service irrespective of conditions, a method which has proved economical for street lamps in certain cities. The value of whitewash in providing contrast and enhancing visibility at low illuminations was emphasised. Several speakers referred to special lighting problems found in signal boxes, where lights must be very carefully screened to enable objects outside on the railway line to be easily seen. It was suggested that possibly the use of fluorescent materials, excited by ultra-violet light, might prove useful. Electric discharge lamps of the mercury type, it was suggested, should be used with discretion in view of the danger of confusion with signals. Devices for use in lighting station names-plates were illustrated.

Some reference was made to the immense amount still to be done in modernising lighting on railways. Mr. A. Cunnington, who presided over the meeting, pointed out the magnitude of the task by which railways were confronted and the reasons why progress was apt to appear slow.

Mr. Bennett, after thanking the audience for their reception of his paper, dealt briefly with the various points raised. He stated that electric lamps were renewed on life where circumstances made this procedure desirable. He doubted whether utilising fluorescence in signal boxes would be of much help, as such surfaces would be as disturbing as any others illuminated to the same degree of brightness.

Lighting Fittings

Artistic Design and Mechanical Construction

There was an entertaining meeting of the Decorative Lighting Section of the Illuminating Engineering Society on February 15, when members were the guests of the General Electric Company, Ltd., at Magnet House.

Mr. E. H. Penwarden, in his paper on "The Relation between the Artistic Design and the Mechanical Construction of Fittings" made a number of good points which were well illustrated by selected drawings. Mechanical construction, a perpetual problem to the manufacturer, is apt to be ignored by the designer. It must be often co-ordinated with considerations arising from light distribution. Maintenance is often sadly neglected. Economic claims may cause real difficulty to the artist, who should also have a knowledge of the various materials available. Two usual lines of approach to the problem, involving sympathetic co-operation between the designer and the illuminating engineer, are (a) a preconceived design to be made into a practical lighting unit and (b) predetermined lighting apparatus to be enclosed in an artistic housing. Examples of fittings designed by two eminent architects were presented, one a fitting designed for a banqueting hall in Rangoon, where ventilation and avoidance of collection of insects had to be specially considered. The design and construction of fittings used on board ship call for special treatment owing to motion, vibration, and low ceilings. Some shipping companies now instal very distinctive architectural lighting. Other fittings described and studied included those used at Messrs. D. H. Evans's stores, recently visited by the Society. A method of interest, often compatible with quite strong and rigid fittings, is part production in sheet metal. An instance of such methods, a section of a fitting made in 20 gauge copper, with all sections soldered without any riveting, was shown to the audience.

In conclusion Mr. Penwarden submitted that, after taking due note of all relevant factors, the artist takes first place. The mechanical construction is subservient to artistic design, even though the artist must sometimes accept limitations imposed by mechanical and scientific lighting requirements.

A good discussion was opened by Mr. Waldo Maitland, who deprecated excessive use of metalwork, forming a black silhouette against bright glass, emphasised the important part played by plastics in decorative lighting, and referred to the increasing use of glassware in large masses.

Mr. L. R. Tucker, after submitting a possible division of fittings into four main sections, expressed the view that the design of the architect was easier to reproduce than that of the artist, but drew attention to successful co-operation between the artist and the manufacturer in Sweden and elsewhere.

Major P. A. Smith referred to some of the difficulties experienced by electrical contractors, such as inadequate wireways, no earthing provisions, non-standard parts, etc., and stressed the advantages of dealing with actual makers of fittings of good reputation.

Dr. S. English, Mr. Piper, Miss Robinson, Mr. Holmes, Mr. Robins, Mr. Barnicot, Mr. Lovel, Mr. Dow, and Mr. Stroud were amongst others who spoke. A vote of thanks to the lecturer and to the G.E.C. for their hospitality, moved by Mr. A. W. Beuttell, who presided, terminated the meeting, after which the display of fittings at Magnet House was inspected.

Modern Store Lighting

A Visit to the Premises of D. H. Evans & Co. Ltd., Oxford Street, London, W.

In what follows we give an illustrated account of the lighting of this important store, which was visited by members of the Decorative Lighting Section of the Illuminating Engineering Society on Jan. 27, 1938 (*Light and Lighting*, Feb., 1938, p. 33).

Fig. 1. Showing the upper floors of Messrs. D. H. Evans' store floodlighted at night by twenty-seven 250 watt Osira electric discharge lamps mounted on the top of the canopy running round the main frontages.

The lighting of this store furnishes a good example of the use of enclosed diffusing fittings for general lighting, enabling glare to be successfully avoided and yet providing a high standard of illumination. In general the illumination is of the order of 25 foot-candles on the ground floor and averages 15 foot-candles on other selling floors, and is supplemented in many cases by special local concealed lighting, such as for revealing and emphasising objects in glass cases, alcoves and niches, etc. Apart from the value from the standpoint of salesmanship of a generous illumination, there is another important reason for this high intensity—namely that the bulk of the lighting is required during daylight hours. It is therefore necessary to make sure that the effect does not appear depressing in comparison with the bright daylight out of doors.

Interior Lighting.

It will be of interest to review briefly the general lighting conditions on the various floors.

On the *Ground Floor* (see Fig. 2) there are in all 105 enclosed pendant units of G.E.C. design. Each is glazed with white flashed opal glass and has at the base a ¼-in. obscured plate glass disc, which can be removed to facilitate cleaning or replacement of lamps, and contains a 750-watt lamp. The illumination on the working plane lies between 16 and 25 foot-candles, and the consumption is about 2.44 watts per sq. ft. Near entrances, and at certain other points, the general lighting is supplemented by built-in beams and flush or recessed panel lighting.

On the *First Floor* there are 260 units or units in multiple. Each unit consists of a recessed laylight, 5 ft. by 2 ft., projecting 3 in. below the ceiling, glazed with white streaky opal glass and provided with three 150-watt lamps fitted with conical mirror reflectors behind. The average illumination is 15 foot-candles, and the consumption 3.25 watts per sq. ft. The laylight units used on all the showroom floors are made in a standard size of 5 ft. by 2 ft. In some cases they are arranged in multiples (e.g., 5 ft. by 4 ft., 10 ft. by 4 ft., etc.) and as a ceiling grid system is provided, great elasticity in the layout of the fittings and in the lighting is available.

On the second (see Fig. 3), third, and fourth floors there are 624 similar units, but each unit is provided with ten 60-watt lamps and the glazing is effected with white opal-flashed glass. The fittings project 3 in. below the ceiling on the second floor and 7 in. on the third and fourth floors. The type of unit throughout is excellently adapted to the relatively low ceiling height—the intention in such a store being naturally to get in as many floors as possible and thus secure the maximum of selling area. The average illumination on these floors is of the order of 15 foot-candles, and the consumption of 4.55 watts per sq. ft.

Special Display Lighting, Etc.

Throughout the building liberal use is made of local concealed lighting by the aid of trough lights and panels. These special lights are all fed from a floor grid system, which is quite distinct from the general lighting. This provides a very elastic source of supply, as floor outlets are available at approximately 5 ft. centres over the whole showroom area.

On the higher floors the *Escalator Landings* have distinctive lighting to suit the fluted ceilings, the fixtures consisting of flashed opal troughs. (Incidentally these fluted ceilings seem to have an advantageous effect in making less evident any inequalities in ceiling lighting arising from the box-type fittings used.) In the *restaurant* (Fig. 4) on the fifth floor the lighting is effected entirely from concealed cor-

Fig. 2. A Ground Floor view showing diffusing pendant units.

Fig. 3. A view of the Second Floor Showroom showing the effective laylight fittings.

Fig. 4. A view of the Restaurant (Fifth Floor) where the party assembled.

Fig. 5. A section of the Hairdressing Dept., where special lighting arrangements are provided.

nices and soffits, etched glassware forming part of the mirrored scheme for completing the effect. There are approximately 726 ft. of cornice, using 25-watt lamps on 8-in. centres. The average illumination is 4 foot-candles and the consumption 1.93 watts per sq. ft. Provision is made for also introducing three-colour neon or other effects, if so desired.

The *Hairdressing Department* (Fig. 7) was one of the most interesting sections visited, owing to the remarkably complete and detailed equipment, which involves special lighting. In general display lighting combined with laylights is provided, and there are mirror trough disc lights in the cubicles, which are sixty-seven in number. In these cubicles plug outlets for portable lights and heating and other special appliances are also provided. The general illumination in this section is 10 foot-candles, with 25 foot-candles in the cubicles.

The lighting of the staff workrooms, kitchens, etc., is of an up-to-date and practical character, but requires no special description. In the kitchens 5-8 foot-candles is provided, and in the workrooms, offices, and staff cafeteria about 10 foot-candles.

Exterior Lighting and Windows.

The illumination of the *outside of the building* (See Fig. 1) is effected by means of twenty-seven 250-watt Osira mercury vapour discharge lamps. The light is projected from the top of the canopy running round the main frontages. The moonlight effect is well suited to the Portland stone and grey granite with which the building is faced and contrasts well with the lighted windows below. *The canopy* itself is at present lighted by reflection from the display windows in combination with local intersecting trough-lighting utilising architectural (tubular) lamps. Provision is here made for either three-colour neon or additional trough lighting in the future.

The *Display Windows* are illuminated by over 200 G.E. CoRay silver glass reflectors, equipped with 60-150-watt lamps and combined with built-in panelling glazed with white streaky opal glass. The arrangements permit a very high order of illumination combined with complete absence of glare.

Distribution Data, Etc.

The electric supply is taken from the St. Marylebone Borough Council's mains and is brought into the premises at 6,000 volts, and is transformed down to the standard low tension 3-phase 4-wire distribution pressure. From the sub-station main feeders supply to two main switchrooms; the north switchroom is fed by bare copper bars run on insulators having a total capacity of 3,000 amperes per phase, and the south switchroom by armoured cables having a capacity of 1,000 amperes per phase. Totally enclosed ironclad main switchboards are provided.

There are primary lighting distribution boards on all floors up to the fifth floor, the lighting in each case being controlled by local overload contactors operated by remote control from the basement. Secondary lighting throughout the building is also provided, on which certain permanent lights are run when the building is open to the public.

The total connected load is 2,100 kW. for lighting and 625 h.p. for power.

(*We are indebted for the above illustrations and data to Messrs. Drake and Gorham, Ltd., the electrical contractors, for the installation. The architect is Mr. Louis Blanc, L.R.I.B.A., whilst Messrs. Fredk. Sage and Co., Ltd., were responsible for the Hairdressing Department.*)

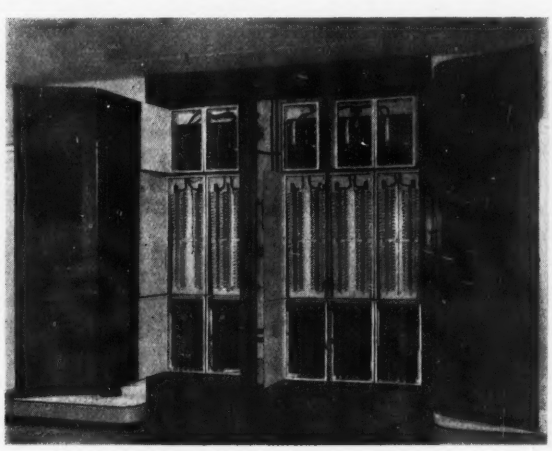


Fig. 6. One of the Floor Distribution Boards, open for inspection.

Fig. 7. A view on the Fourth Floor, showing characteristic local lighting arrangements for display.

Electric Street Lighting

Accrington.—A start has been made with the introduction of electric lighting in side streets, part of the scheme being now in commission in the Ormerod-street district.

Battersea.—The sodium discharge lamps in St. James's-road are considered to have proved satisfactory, and this system is to be adopted elsewhere in the borough.

Blackburn.—The Borough Engineer is to co-operate with the gas and electrical engineers with a view to preparing a report on the street lighting.

Bromley, Kent.—The installation of sodium electric discharge lamps in Burnt Ash-lane is recommended; 150-watt lamps are to be installed 150 ft. apart and 26 ft. high. Improved lighting in Hayes-lane is also advised.

Dewsbury.—The Electricity Department's tender for the lighting of Aldans-road has been accepted. Mercury vapour electric discharge lamps will be used.

Dumfries.—A scheme for the lighting of certain streets with sodium discharge lamps is being prepared.

Edinburgh.—Experiments with fluorescent colour-corrected lamps in George-street are being conducted.

Glasgow.—Considerable progress with electric lighting has been made in recent years. It is hoped ultimately to control all such lighting, both highways and "common stairs" instantaneously from a small number of central points.

Gloucester.—Following the recent M.O.H. inquiry the Corporation Electrical Undertaking and the Gloucester Gas Company will both be afforded opportunities of tendering for the lighting of the streets in question. Trials of both systems will be arranged in the vicinity of Regent-street.

Leeds.—Experiments with colour-corrected mercury fluorescent discharge lamps are to be made in Roseville-road.

Maidstone.—A system of ripple control for lighting and extinguishing Maidstone's street lighting has been inaugurated. A feature of the system is the instantaneous control afforded in emergencies, such as air raids.

Manchester.—A system of central street lighting control is being introduced.

"Electric Street Lighting"—
an important new publication

All *modern* progress in Street Lighting is based on the modern advance in electrical development, and those whose concern is efficient Street Lighting should study this book with great care. It explains clearly the essential features of the final report of the Ministry of Transport's Departmental Committee and is the most up-to-date handbook on this important subject

In the very difficult case of tree-lined roads central suspension sometimes provides the only possible means of lighting.

LAMPS ON ONE SIDE ONLY

Para. 41 For the same reason lamps on one side only cannot efficiently light a road—the opposite side remaining obscure.

TREE-LINED ROADS.

Para. 42 Good lighting is difficult to obtain on a road lined with trees overhanging the carriageway; the problem can sometimes be solved by judicious lopping of branches, but the local authority will often be faced with the alternative of sacrificing one or the other, whichever in their own view is the less important. A compromise, however, may sometimes be achieved by using central suspension.

INTERSECTIONS, JUNCTIONS, ROUNDABOUTS.

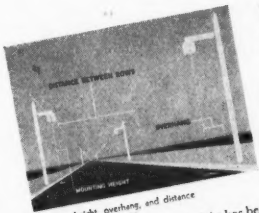
be placed in the main road immediately opposite the side road . . ."

"*. . . Where two traffic routes cross at right-angles there should be a source on the left-hand side of the road just beyond but not too close to the intersection . . .*" Para. 48

"*. . . at road junctions and roundabouts . . . sources should be so sited that a driver can . . . see . . . that he is approaching a junction, . . . also appreciate the routes through the junction.*" Para. 49

In the illustration above, the solid arrows point to the approach road served by each of the lamps. Only one lamp on an approach road is seen, the dotted arrow indicating the most important direction served.

14



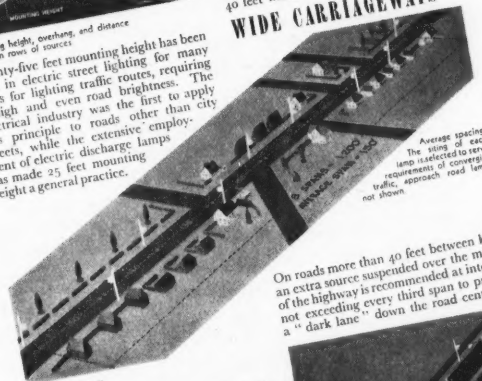
Mounting height, overhang, and distance between rows of sources

OVERHANG

Para. 36 Overhang is required on wide roads because the width of the "brightness areas" from individual lamps is generally only broad enough to cover the road when rows of light source on each side do not exceed 30 feet. An overhang of more than 6 feet is liable to leave the kerb and footpath indistinct especially on polished, wet, or heavily cambered carriageways, but the Report indicates that overhang up to 5 feet is sometimes useful on carriageways up to 40 feet wide.

WIDE CARRIAGEWAYS

Twenty-five feet mounting height has been used in electric street lighting for many years for lighting traffic routes, requiring a high and even road brightness. The electrical industry was the first to apply this principle to roads other than city streets, while the extensive employment of electric discharge lamps has made 25 feet mounting height a general practice.



Average spacing. The siting of each lamp is selected to serve requirements of converging traffic, approach road lamps not shown.

Para. 37 On roads more than 40 feet between kerbs an extra source suspended over the middle of the highway is recommended at intervals not exceeding every third span to prevent a "dark lane" down the road centre.

Use of additional centre sources on very wide carriageways.

SPACING

Para. 35 The recommended average maximum spacing of 150 feet, with the mounting height recommended and suitable light sources, enables good visibility to be obtained on average road surfaces. Provided this clause is interpreted with reason, an occasional departure to 180 feet should not introduce patchiness on straight roads owing to the presence of other light sources at reasonable distance. As the Report indicates, an average spacing down to 120 feet is advantageous where economically practicable.

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Literature on Lighting

(Abstracts of Recent Articles on Illumination and Photometry in the Technical Press)

(Continued from page 47, February, 1938.)

III.—SOURCES OF LIGHT.

56. Measurement of Light from a Tellurium Vapour Arc.

J. W. Marden, N. C. Beese, and George Meister. Frank. Inst., J., 225, p. 45, January, 1938.

The tellurium arc yields a continuous spectrum. It will not operate directly on a.c. Owing to the great chemical activity of hot tellurium vapour has to be designed to operate with liquid tellurium electrodes. The enclosing tube runs at a high temperature, necessitating quartz, while the tellurium tends to absorb inert gases used for starting the discharge. High purity of all materials used is essential for satisfactory operation of the lamp. The spectrum consists of superimposed band and continuous spectra, giving a good white light. Efficiency varies with wattage input over a wide range. Data on colour composition of the light are given, the colour varying appreciably with wattage input. S. S. B.

57. Luminous Discharge Lamps.

C. C. Paterson. Elect., 120, p. 99, January 28, 1938.

A summary, with particular reference to luminescent effects, is given of progress during 1937 in the development of electric discharge lamps. C. A. M.

58. Two Recent Applications of Electric Discharge in Gas: For Lighting and for Stroboscopic Effects.

Anon. R.G.E., 43, No. 4, pp. 127-128, January 22, 1938.

Gives a summary of a paper by Gillon for the Bulletin du Cercle des Electriciens de l'Institut électromécanique annexé à l'Université de Louvain, 1937, No. 4, p. 105-128. W. R. S.

IV.—LIGHTING EQUIPMENT.

59. Illumination Glassware.

B. P. Dudding. Elect., 120, p. 79, January 21, 1938.

A summary is given of a lecture by the author to the Society of Glass Technology on recent progress in the development of refracting, reflecting, and diffusing glassware. C. A. M.

60. Electric Eyes Maintain Penn High Lighting Levels.

F. A. Kolb. El. World, 109, p. 35. January 1, 1938.

Photo-electric control equipment has been installed in Penn High School to control an indirect lighting system in the class-rooms. The lights are switched on when daylight falls to 15 foot-candles on the desk tops. Reference is made to extensive tests from which the value of the desirable illumination was determined; and details of the lighting system are given. S. S. B.

V.—APPLICATIONS OF LIGHT.

61. Progress in Illumination.

Anon. El. Journal, Vol. XXXV., No. 1, p. 39, January, 1938.

Reviews progress in illumination in America, including improvements in lamp design and construction, and a street lighting fitting for mercury, sodium, or tungsten lamps. R. G. H.

62. Light and Architecture.

Anon. Am. Illum. Eng. Soc. Trans., 1, pp. 9-16, January, 1938.

A number of representative architectural lighting schemes are shown, with photographs. J. S. S.

63. Study Lighting Conditions.

J. O. Kraehenbuehl. Magazine of Light, VII., pp. 6-11, January, 1938.

A survey of study lighting conditions at the University of Illinois is given. Over a thousand locations were examined, and the merits of the various types of equipment and its surroundings are discussed. C. A. M.

64. Developments in the Electrical Industry during 1937.

G. Bartlett. G.E. Rev., 1, pp. 5-64, January, 1938.

This review includes a section of the technical progress in illumination in America during the past year. J. S. S.

65. 64 Kw. Lighting Load for Chicago Office.

J. V. Gaynor. El. World, 109, p. 74, January 1, 1938.

The relighting of a large Chicago office is described. The units were designed to conform with the architecture, and included several types. An illumination of 35 foot-candles is claimed. S. S. B.

66. 50 Foot-candles for Chain Store Offices.

L. C. Twichell. El. World, 108, p. 1,912, December 4, 1937.

A description is given of the lighting of a large office. High wattage lamps in semi-indirect units at fairly wide spacing are used, and an illumination on the desks of 50 foot-candles is claimed. S. S. B.

67. Lighting for Silk and Rayon Throwing and Weaving.

Committee on Industrial Lighting. Am. Illum. Eng. Soc. Trans., 1, pp. 17-52, January, 1938.

This report gives comprehensive recommendations for illumination values and lighting arrangements for various processes in the artificial silk industry. J. S. S.

68. A New Trend in Window Display Lighting.

F. M. Wolff. Am. Illum. Eng. Soc. Trans., 1, pp. 69-78, January, 1938.

An adaptation of theatrical technique is coming to the fore in shop window lighting, combining spotlights on the main display with attractive background and surroundings. Methods of achieving this effect are described in the paper, with photographs and plans of layout. J. S. S.

69. What's New in Store Lighting?

J. L. Stair and W. V. C. Foulks. Am. Illum. Eng. Soc. Trans. 1, pp. 53-68, January, 1938.

This article discusses present tendencies in the interior lighting of large shops. Photographs given emphasise the decorative nature of the lighting schemes employed. J. S. S.

70. Drug Store Lighting.

Anon. Magazine of Light, VII., pp. 15-17, January, 1938.

Details with photographs are given of the lighting

equipment of a drug store in Miami, of unusual construction. The main floor is surrounded with balconies, and is illuminated from a high central ceiling. C. A. M.

71. Printing Plant Lighting.

M. R. Matteson. Magazine of Light, VII. pp. 32-34, January, 1938.

A description is given with photographs of the lighting equipment of a printing works. Built up indirect lighting units are used exclusively. C. A. M.

72. New Street Lighting at Merton.

Anon. El. Times, 93, p. 137, January 27, 1938.

St. Helier Avenue, a double-carriageway, has been lit with mercury-vapour lamps. Good results are claimed, and a photograph is given. W. R. S.

73. Developments at Stalybridge.

Anon. El. Times, 93, p. 104, January 20, 1938.

Gives a brief account, with photographs, of new street-lighting in Stalybridge and district, where tungsten-filament and sodium lamps have been installed. W. R. S.

74. Reflection Characteristics of Road Surfaces.

Parry Moon and R. M. Hunt. Frank. Inst., J., 225, p. 1, January, 1938.

The authors consider the fundamental factor in adequate street lighting to be knowledge of the reflection characteristic of the road surface, and thence the brightness distribution in the bright patch formed by a single source. They have investigated this distribution by a a photographic method for three common road surfaces in America (smooth and rough bituminous and concrete materials) after several years' use and having a fair degree of polish. An empirical formula for the brightness distribution is developed, and some general conclusions drawn. S. S. B.

75. Tunnel Design Provides Safety and Economy.

J. N. Dodd. El. World, 109, p. 29, January 1, 1938.

Details are given of the electrical equipment for the Lincoln vehicular tunnel under the Hudson River, New York. The lighting provided in the tunnel and in the approach roads is described. S. S. B.

76. Paris Airport Lighting.

Anon. Elect., 120, p. 142, February 4, 1938.

A brief description, with photographs, is given of the interior airport lighting at Le Bourget. C. A. M.

77. Floodlighting.

Anon. Magazine of Light, VII., pp. 26-27, January, 1938.

The floodlighting of the front of the Edison Building in Chicago is carried out by means of 500-w. projectors at 2 ft. centres, mounted on a projecting ledge above the ground floor. Photographs are given. C. A. M.

78. Spectacular Lighting.

Anon. Magazine of Light, VII., pp. 20-25, January, 1938.

Numerous photographs are given of spectacular lighting both at the Paris Exhibition and also in Germany. C. A. M.

79. Forty Million Kilowatt-Hours for a Fair.

Anon. Elect. Engineering, 56, p. 1,449, December, 1937.

A general description is given of the illumination plans for the 1939 Golden Gate International Exhibition. S. S. B.

Recent Patents

(Abstracts of recent Patents on Illumination & Photometry.)

No. 476,433. "Improvements in and Relating to Electric Discharge Lamps."

The British Thomson-Houston Company, Limited, and Davies, L. J. Dated June 8, 1936.

This specification covers a signalling discharge lamp in which the discharge is normally a diffused arc of low intrinsic brilliancy, but may be swept up by a magnetic field into a constricted portion of the lamp whereby its intrinsic brilliancy is increased.

No. 476,626. "Improvements in or Relating to Street Lamps, Flood Lamps, and Other Lamps Provided With Electric Discharge Lamps."

Starkie, D., and The Amplilux Lighting and Illumination Company, Limited. Dated June 8, 1936.

This specification describes a street or flood lighting arrangement comprising a vertically arranged electric discharge lamp and light distributing means comprising a transparent body of prismatic form arranged laterally of the vertical axis of the discharge lamp and such as to reflect internally part of the light issuing from the discharge lamp so as to illuminate the zone disposed in a vertically downward direction from the lamp which would otherwise be shadowed by the lower electrode of the discharge lamp, the major part of the light being only slightly deflected or not at all.

No. 476,818. "Improvements Relating to High-pressure Metallic-Vapour Electric Discharge Lamps."

Siemens Electric Lamps and Supplies, Limited, and Aldington, J. N. Dated June 29, 1936.

In order to produce a disc-like light source, for use in lighthouses, for example, a high-pressure metallic-vapour discharge lamp is, according to this specification, arranged for the production of a number of intersecting discharge arcs in one undivided vessel in which a separate pair of electrodes is provided for each arc. The feed circuits of the several electrodes are preferably distinct.

No. 476,833. "Improvements in or Relating to High-pressure Metal-Vapour Electric Discharge Lamps."

The General Electric Company, Limited. (Communicated by Patent-Treuhand-Gesellschaft Für Elektrische Glühlampen m.b.H.) Dated September 25, 1936, *May* 11, 1937. *(Cognate Applications.)*

This specification relates to high-pressure metallic-vapour discharge lamps such as are used for light sources in optical projection apparatus, and has for its object to prevent blackening of the part of the wall through which the light passes. A hood which is open at both ends is disposed above the electrodes so that, when the lamp is operated with the discharge path immediately below the lower aperture of the hood, convection currents pass through the hood so that most or all of the solid material entering the gas filling is deposited on the hood.

No. 477,387. "Improvements in or Relating to Searchlights."

Savage, J. C. Dated March 26, 1936.

This specification covers a searchlight of which the beam is adapted to be traversed to and fro to different extents and to be spread or diverged in linear proportion to the extent of the traversing movement. An assemblage of mirrors is mounted in front of a projector producing a parallel beam. The assemblage is mounted as a whole at an inclination to the beam and comprises a mosaic of mirrors which are angularly adjustable with respect to one another. The assemblage may be rocked as a whole and a co-ordinated angular movement may be imparted to the mirrors.

No. 477,583. "Improvements Relating to Electric Lamps."

Joseph Lucas Limited and Watson, E. A. Dated June 30, 1936, *July* 18, 1936. *(Cognate Applications.)*

This specification covers an electric lamp enabling discharge bulbs to be conveniently used in mines or on vehicles, ships, or aircraft. The lamp comprises the combination of one or more mercury or other discharge bulbs and a rotary alternating current generator of the permanent magnet type of which the sole duty is to supply electrical energy to the bulb or bulbs and which has a high inherent reactance so that it is capable of both starting the bulb or bulbs and maintaining the discharge, the bulb or bulbs and the alternating current generator being combined in a unitary structure. The generator may be driven by a pneumatic turbine motor mounted in the body of the lamp.

No. 477,638. "Improvements in or Relating to Optical Projecting Systems, Particularly Spot Lights."

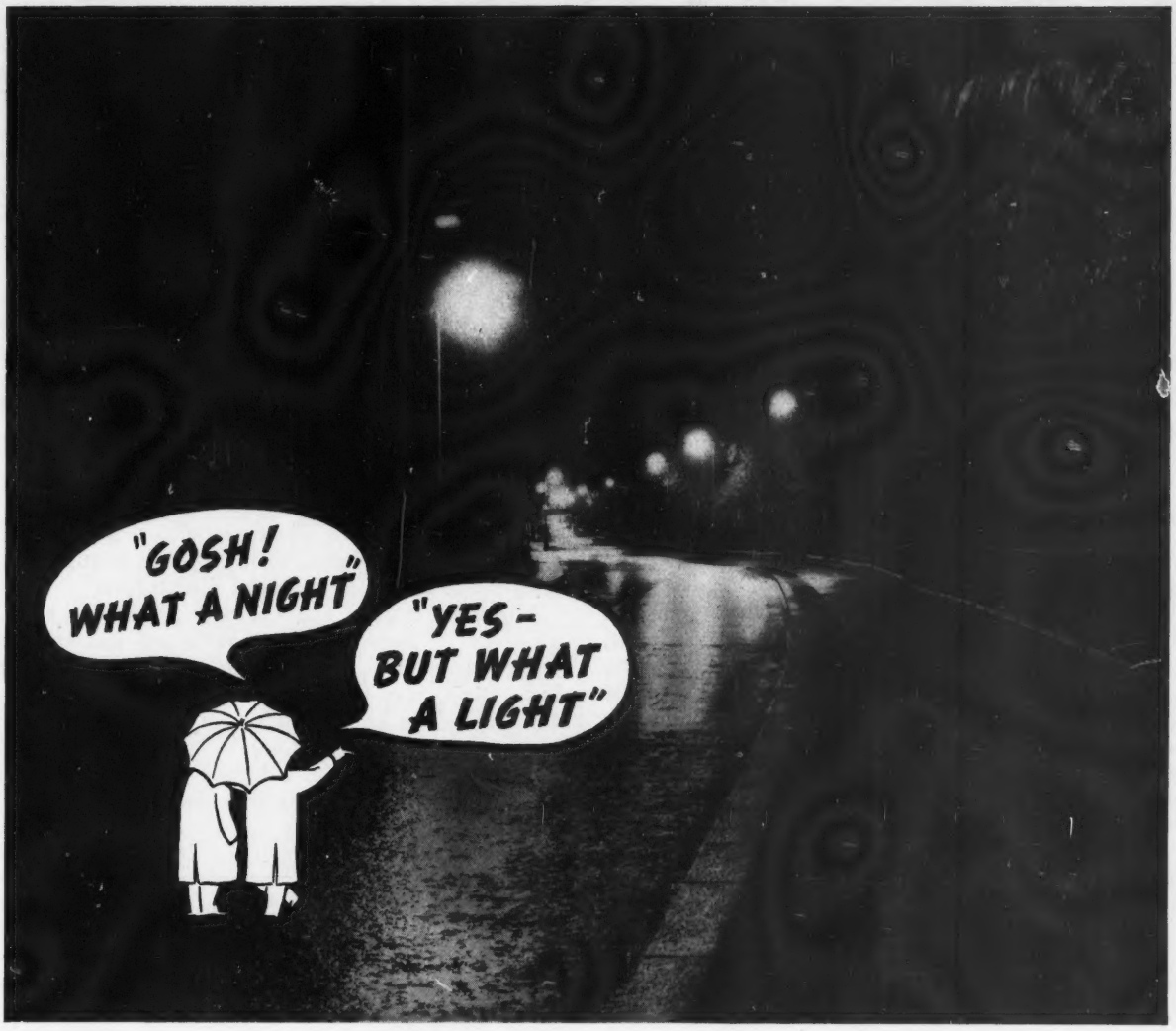
The General Electric Company, Limited, and Beggs, S. S. Dated October 6, 1936.

This specification relates to spot lights adapted to produce a beam of which the divergence may be varied by variation of the distance between the light source and the optical system. A diaphragm is fixed relative to the optical system pierced by a hole so dimensioned and located that: (a) When the beam produced by the optical system has a small divergence the boundary of the illuminated area is not rendered diffuse by the aberrations of the optical system, the diaphragm in this case effectively reducing the aperture of the optical system; (b) when the beam is of large divergence the aperture of the optical system is not materially reduced ; and (c) that whether the divergence be large or small no light from the source is emitted outside the angle of divergence of the beam. The optical system may be either a mirror or a lens.

No. 477,722. "Improvements in Street Lanterns for Gas Lighting."

Edwards, E. M. Dated October 21, 1936.

This specification describes a gas street lantern wherein the actual roof of the lantern is comprised of two directional reflectors in the form of approximately half-round tapering shells with their smaller ends innermost, which form an integral part of the lantern roof, the glazed walls of the lantern body being extended up to close the outer ends or mouths of the directional reflectors. The two tapering shells may adjoin a common intermediate or central zone directly above the gas burners.



YOU don't need a downpour to test the truly striking efficiency of "Philora." But a real 'Soaker' will certainly emphasize the difference between this new road lighting technique and previous methods of illumination. The beauty of a "Philora" Sodium or Mercury installation for the motorist or pedestrian lies in the sharpness of definition which it gives, the great distance of visibility, and the fact that the eye is drawn to the road and surrounds and not to the light itself. The beauty of "Philora" lamps from *your* point of view lies in their generous light efficiency and lower current consumption, and in their long, reliable life.

Look into this new lighting technique and make use of our trained lighting engineers, who are at your disposal.

PHILIPS "PHILORA"

SODIUM AND MERCURY ELECTRIC DISCHARGE LIGHTING

PHILIPS LAMPS LTD. ("PHILORA" DEPT.), 145 CHARING CROSS ROAD, LONDON, W.C.2

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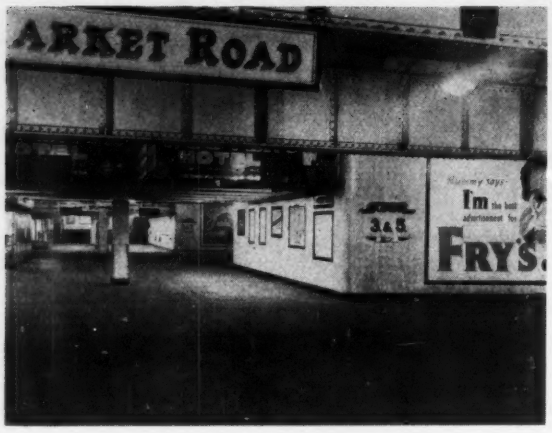
Lighting of the New G.W.Rly. Subway, Temple Meads, Bristol



High section of the Subway lighted by Holophane Ripplelite units.

Lighting from Holophane Asymmetric Dome Refractors fitted into the roof recesses and directing the light towards the posters on the wall.

We reproduce above two views showing a new and interesting light installation in the new Temple Meads subway for the Great Western Railway at Bristol. The problem consisted in providing efficient illumination for the floor of the subway, 30 ft. wide, whilst also furnishing a high illumination on the posters on the walls. The roof of the subway is of corrugated steel and advantage was taken of recesses in the roof to conceal the lighting units, thus eliminating glare in the eyes of people using the passage. The side of the subway designed for poster display is equipped with 100 w. lamps in Holophane asymmetric prismatic dome refractors, which give a strong downward light, with a special angular light-segment to serve the needs of the posters.

The other half of the subway, in which there are a number of kiosks and shop windows, was equipped with symmetrical dome refractors for general lighting. Both rows of refractors are spaced 8 ft. from the wall. The higher section of the subway at one end was equipped with 200 w. Holophane "Ripplelite" units mounted at a height of 10 ft. 6 in. The work was carried out by the electrical staff of the Great Western Railway.

Modern Street Lighting

Some Further Comments on the M.O.T. Report

Addresses on modern street lighting, dealing specifically with problems arising in connection with the Report of the M.O.T. Street Lighting Committee, have been recently arranged in connection with the E.D.A.—E.L.M.A. Street Lighting Conferences. Mr. Maxted, of the B.T.H. Research Laboratory at Rugby, delivered addresses on this topic in Edinburgh on Januaray 25 and in Glasgow on the following evening, whilst Mr. Catten (associated with the B.T.H. in London) gave an address at Belfast on January 28.

The addresses consisted in part of a recapitulation of the chief points in the report, which was summarised in our last issue and previously, and should thus be familiar to readers. The authors laid stress on visibility and on the essential function of street lighting to reveal pedestrians on the roadway. Light fences and building fronts, which form good backgrounds, are therefore very important, especially at bends, in order to reveal cyclists riding near the kerb.

The two main reasons for selecting a mounting height of 25 ft. are the diminution in glare at higher levels and the more even road brightness secured. A maximum limit to spacing also promotes more uniform brightness, and is specially important when road surfaces are wet. The choice of overhang is clearly a matter of some complexity. Brightness and visibility of the pavement, kerb, and road centre depend very greatly upon surface conditions and lantern distribution. The recommendations are based on the view that visibility at the kerbline should take precedence over that at the road centre, and the impression is gained that it has been felt essential to get the best possible visibility at the sides of the road, even if the best overall result cannot be secured in particular cases.

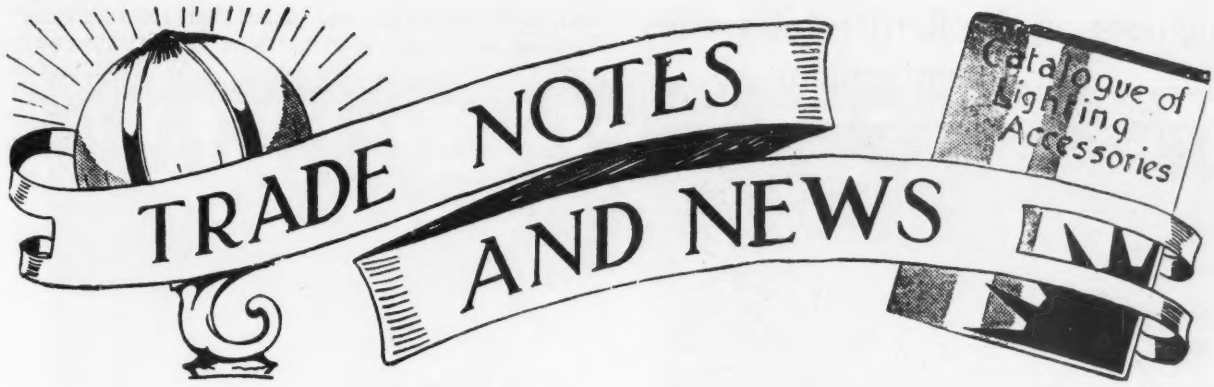
The broad principle of locating lanterns on the outer curve of a bend is admitted, but likewise the difficulty of specifying exact location. Even assuming the value of the "angle method" there is the question of road surfaces. One may expect a reduction in spacing which becomes closer as the bend becomes sharper. Spacings in some cases at distances as low as 50 ft. may be expected.

The addresses discussed in some detail the recommendations on lanterns and distribution, and on the two broad types of distribution—the "cut-off," with maximum intensities at 60 degrees to 70 degrees, and the "non-cut-off," with which high intensities are maintained at angles closely approaching the horizontal. The report does not declare definitely in favour of either type of fitting. With the cut-off type glare is greatly reduced, but road brightness is lower and closer spacing is necessary. With lanterns designed for a spacing of 150 ft. a cut-off may, however, be introduced above 86 degrees without causing dark patches and without appreciably lowering the road brightness. This degree of cut-off, whilst small, has a marked effect in reducing glare from lanterns at distances of more than 280 ft. from the observer.

After explaining the recommendations in regard to ratio of candle-power at different angles, designed to reduce glare, the authors recalled the preference expressed for uniform road surfaces and light-coloured kerbstones, and discussed the new problem of dual carriage-ways, which should be treated separately in accordance with the recommendations for single roads.

In conclusion, attention is drawn to the difficulty of making recommendations in regard to a subject in a very active state of development, and to the many problems facing the committee concerned with the drafting of a new British Standard Specification for Street Lighting. In the report it has been thought necessary to legislate for average or general conditions. Further developments should tend to decrease spacings, and the only limit here is economic. Some uncertainty is expressed in regard to overhang and the details of spacing at bends, for which a more rigid interpretation may be included in the specification.

The most valuable contributions of the report are those setting a maximum limit for spacing and minimum limits for mounting height and lamp size. Appreciation of the attention focussed on danger points, such as bends and road junctions, is also expressed.

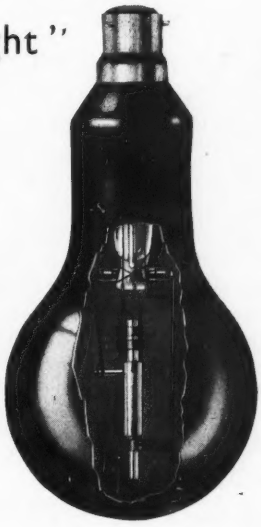


"Thorlux" Industrial Reflectors

Manufacturers of lighting equipment must be constantly on the alert to keep pace with changes in lamp-design. Already there is a demand for reflectors for use with the new 80-watt and 125-watt high-pressure electric discharge lamps, which are likely to be widely used industrially. A list before us, issued by F. W. Thorpe, Ltd., of Birmingham, shows an excellent variety of such fittings, which have evidently two good qualities, robustness of construction and easy removal for cleaning. Standard types completely concealing the lamp from view are listed; also those of the angle type, and of the distributing type for use where large areas need to be illuminated and high illumination in a vertical plane is desired.

Mazda "Black Light"

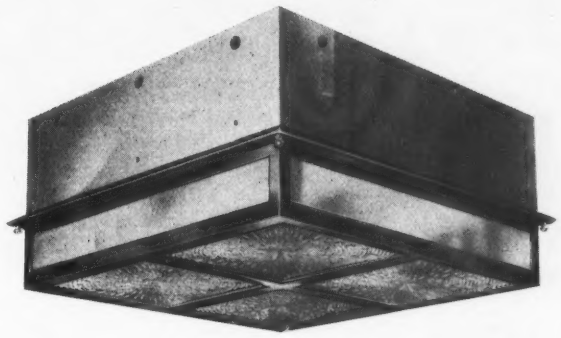
We present here a sectional view of the new B.T.H. Mercra lamps adapted to produce ultra-violet radiation — or what is sometimes fancifully termed "black light." The special glass used for the bulbs filters out almost all the visible light, allowing u.v. radiation to pass. As was shown in connection with the company's exhibit at the British Industries Fair (see p. 76), such lamps may be used to excite patterns of fluorescing material with striking effect.



Sangamo Time Switches

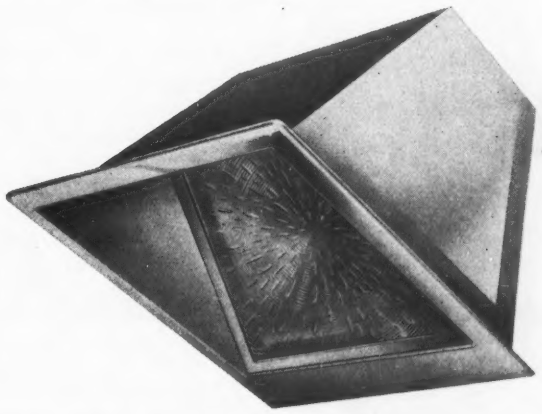
A leaflet before us illustrates type SS Sangamo time switches for automatic time control, in connection with street lighting, illuminated show windows, neon signs, heating and power circuits, etc. The switch is of a very compact design, considering the wide range of performance demanded from it. Of special interest are the bakelite housing and plug-in mounting; the interchangeability of the day and solar dials; the day-omitting device; the external manual operation, and the fact that all live parts are situated behind the front plate of the switch. Solar dials are designed for different latitudes, and settings may be made up to three quarters of an hour on either side of normal sunrise and sunset times.

Holophane Built-In Fittings



A pleasing "Intensive" semi-recessed type with Controlens extended to include glass panels.

It will be recalled that at the opening meeting of the Illuminating Engineering Society in October last there was a display of the new Holophane built-in fittings, which were subsequently illustrated in this journal. Full details of these units have recently appeared in a well-illustrated catalogue issued by Holophane, Ltd. Scientific control of light is skilfully combined with pleasing appearance. Flush fittings, semi-recessed and close ceiling units can be supplied and there are actually forty-five types in all. We illustrate one of the semi-recessed type, very suitable for use in large stores, and also an angled type of unit intended for use in hospitals. The Controlens prismatic plates are made in many varieties giving different forms of light distribution and may be square, round, flat, or "dished" in shape. The system is thus a remarkably flexible one.



A unit of the multiple Controlens type for use in illuminating operating tables in Hospital Theatres.

Lighting at the British Industries Fair (Birmingham)

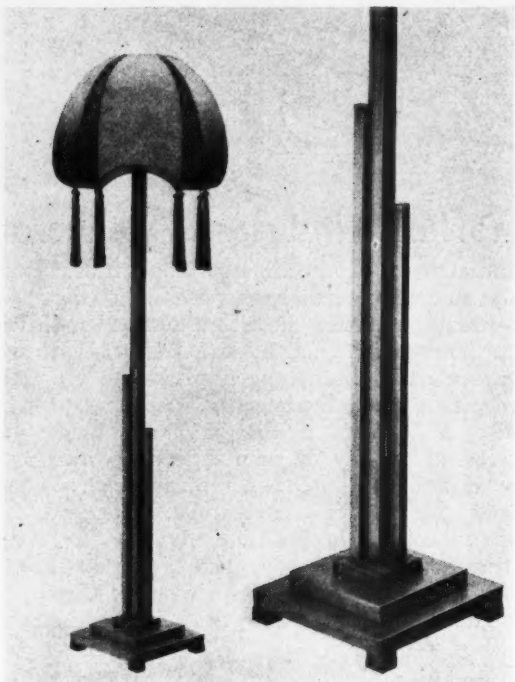
A view of the interior of the B.T.-H. stand showing the glowing pattern on frieze and ceiling, excited by ultra violet radiation from the special lamps above the suspended shield.

The British Industries Fair, Castle Bromwich, where members of the I.E.S. Council were entertained to luncheon on February 22, seemed to be quite as popular as ever. There was much to see of general interest, though little very novel in the lighting field. An interesting item was the frieze and ceiling inside the B.T.H. "star-shaped" stand, on which there was a decorative design laid out in fluorescent materials and illuminated by the new "Mercra" lamps with ultra-violet filter bulbs. The illustration above gives an idea of its appearance, though it cannot, of course, give any impression of the colours, on which the effect largely depends.

At the stands of the General Electric Co., Ltd., Revo Electric Co., Ltd., and Simplex Electric Co., Ltd., there were again representative displays of modern street and industrial lighting equipment for use with discharge lamps. Decorative electric fittings were also well shown by L. G. Hawkins and Co., Ltd., and elsewhere we were struck by a very representative display of "Realite" fittings for industrial use.

In the gas section there was a good display at the stall of W. Parkinson and Co., of their familiar street lighting lanterns, whilst pleasing gas fittings were shown by Evered and Co., Ltd., Wm. Whitehouse and Co., Ltd., and the Lighting Trades Syndicate, and others.

The number of firms who exhibit fittings and lighting accessories as part of their display seems to be



A pleasing type of Standard shown at the Fair (Wilcox and Pitman).

increasing, and one noted many quite interesting "gadgets." One such exhibitor (Messrs. Wilcox and Pitman) has sent us the accompanying picture of a standard of good design, forming part of a representative show of standards in chromium and oak, table lamps, and glassware, etc. One was again struck by the way in which the applications of plastic materials are increasing, both as a medium for the supports of fittings and in the form of translucent material for shades and panels used for decorative lighting effects.

A design of massed columns. Overall height 15 inches.

Pottery Table Standards

A series of six leaflets illustrating new designs of Pottery Table Standards, two of which are shown herewith, has been recently issued by Siemens Electric Lamps and Supplies, Ltd. They are all Staffordshire pottery and of distinctive appearance. The series of massed columns round the standard of the lamp shown on the left is effective, and is fitted to a beige-tinted linen Rhodoid shade to match. In the design on the right we have decorated colours on beige and a hand-painted shade. Both lamps are wired complete with chromium-plated switch lampholder. The other designs are also good and furnish a varied choice of colours.

A design in decorated colours on beige, with hand painted parchment shade to match. Overall height 14 inches.

The Illuminating Engineering Society (U.S.A.)

Notes on the Current Transactions (January, 1938)

NEWS: *A Contest for the Design of Table and Floor Lamps* has been launched by the I.E.S., the American Institute of Architects and the American Institute of Decorators. It will be held over the period Jan. 15 to Mar. 15, and is open to all allied professions except the actual lamp, or lamp equipment, industry. Prizes totalling 1,600 dollars will be awarded. The consumption for lighting and illuminations during the 288 days of the coming *next World Fair at San Francisco* (Feb. 18 to Dec. 2, 1939), is estimated at approximately 40,000,000 units. A committee of Illuminating Engineers has been formed, and approximately 1,000,000 dollars will be spent on illumination and electrical installation alone. The drive *to prevent industrial accidents by improving the lighting conditions in factories* has resulted in only two out of the five persons who would have been disabled under 1926 conditions, being disabled under 1936. A first estimate gives over half a million large-size tungsten *lamps sold in the United States during* 1937. Miniature lamps are estimated at 440,000,000 in the same period.

SUBJECTS OF PAPERS: *Lighting for Silk and Rayon Throwing and Wide Goods Weaving*, by Henry B. Dates. A detailed analysis of all operations is given with regard to the particular problems involved. A survey was made in five different plants to ascertain present conditions of lighting. Investigations, with the object of applying the recommendations published in the report, were then initiated. The three aims are to improve defects in lighting, such as may result in actual failure of production, to provide adequate lighting conditions, to cut down time of stoppages caused by broken threads or other failures, and to develop good general lighting conditions "to improve the cheerfulness of the surroundings and to promote order and cleanliness."

What's New in Store Lighting? By J. L. Stair and W. V. C. Foulks. This fully illustrated paper presents fine examples of modern shop-fitting. In no direction has modern architecture been so fully developed as in the field of shop fitting. As a result fine examples of the blending of architecture with the application of artificial light can be presented. In 1930 the average illumination value in six leading department stores in New York City was approximately 7 f.c. To-day 35 f.c. are provided in case of alterations or new installations. Special fittings and examples of downward directed lighting and semi-indirect lighting are discussed. Indirect units emitting a controlled direct flux giving an illumination of 60 f.c. on the sales counter, e.g., in jewellers shops, are described.

A New Trend in Window Display Lighting. By Fred M. Wolff. Two essentials are claimed for modern light application in shop windows, firstly, it should make the merchandise visible, and, secondly, it should enhance the attraction of the goods displayed. Whilst the first aim can be realised fairly easily, the second proves a more difficult problem, being closely connected with the particular dressing of a window, i.e., it is not the goods in principle which decide the application of light, but the particular form of display. Typical problems and their solution are illustrated by photographs and sketches. A third form of application, the use of light as a display element in itself, is also discussed. This leads to the provision of equipment similar to that on miniature stages.

Constitution and Bye-laws of the Illuminating Engineering Society. The official wording of the society's constitution is given in twelve articles.

Index to "Where to Buy"

N.B.—The numbers are those attached to individual entries in the Directory (See pp. 79-81).

Philips House

A new landmark in London will be Philips House, which is to form the new headquarters of Philips Lamps, Ltd., well known to our readers as manufacturers of electric lamps, but also identified with many other fields of work such as radio receivers, X-ray apparatus, etc. With a main frontage on Shaftesbury Avenue, this new nine-floor building will rise to a height of 100 ft., and will occupy a site of some 15,500 sq. ft. The building is expected to be completed by February 1939. It may be recalled that only a few months ago the building of a new Philips factory at Blackburn (Lancs), work on which is proceeding apace, was announced.

Photo-Cells Control Advertising Signs

The use of photo-cells to control advertising signs is extending. They render unnecessary the presence of an attendant, switching the signs on and off automatically at sunset and dawn and also putting them in action during dull periods of the day, when they can be seen to advantage. Another novel application of such cells, mentioned by the General Electric Company, Ltd., is to give warning at night of the arrival of cars at petrol filling stations—the apparatus being set in action (and the sign lighted up) by the headlights of the approaching vehicles

Catalogues and Advertising Literature

We invite all firms in the Lighting Industry to send us new catalogues as they appear, for reference in these columns

BRITISH SANGAMO COMPANY, LTD.—Leaflet describing the Sangamo Time Switch as applied to automatic control of street lighting, shop window lighting, neon signs, etc.

CLAUDE GENERAL NEON LIGHTS, LTD.—Leaflet describing the production of neon signs and illustrating recent installations.

CURTIS LIGHTING COMPANY OF GT. BRITAIN, LTD.—Leaflet featuring Curtis "Edge-Ray" Iluminaires.

GENERAL ELECTRIC COMPANY, LTD.—Osram G.E.C. Bulletin (Feb.) contains illustrated notes on many applications of lighting, including lighting of air routes, clubs, theatres, cinemas, specialised factories, etc.

HOLOPHANE, LTD.—"Scientific Industrial Lighting," a comprehensive booklet containing general notes on illumination, details of industrial units, and pictures of recent industrial lighting installations.

JOHN ISMAY (NEON SIGNS), LTD.—Leaflets displaying neon signs, low voltage neon, etc.

LUSTRAY PRODUCTS.—Catalogue containing views of pendants, ceiling fittings, etc.

SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD.—Illustrated catalogue featuring "Benjamin" reflector fittings and lighting specialities.

F. W. THORPE, LTD.—Leaflets illustrating new types of reflectors for use with mercury discharge lamps.

Foire de Paris

May 21—June 6, 1938

Particulars have reached us of the Foire de Paris (Paris International Trade Fair), which is to take place in Paris during May 21 to June 6. The fair was founded in 1904, and on the last occasion there were 8,500 exhibitors, representing thirty-three countries and occupying over four million sq. ft. In connection with the fair an Inventions Competition is organised with prizes of 5,000, 3,000, and 2,000 francs as well as smaller ones. In Group (2) of the competition lighting and decorative arts are included. Entries must be received in Paris by May 14. Particulars of the competition and of the fair generally may be obtained from the offices for Great Britain at 17, Tothill Street, London, S.W.1.

Public Lighting With Gas

Contracts for gas lighting for the streets under their control have been made by the authorities at Draycott, Sandiacre, Breaston, and Stapleford. The agreements for Sandiacre and Stapleford are for periods of three years.

At the Gas Light and Coke Company's annual general meeting it was stated that during the past twelve months the company was granted two fifteen-year, five ten-year, and three five-year agreements for gas street lighting. The sale of gas for this purpose showed an increase of some 130,000 therms as compared with the preceding year.

About 724 lamps are affected by a five-year contract for gas lighting entered into by the Bishop Auckland Urban District Council. The contract comes into force on July 1.

The Burton Latimer Urban District Council has granted a three-year contract for street lighting by gas. Various improvements are to be carried out in the lighting of the district.

A sum of £2,300 is to be spent by the Blackburn Corporation Gas Department on the lighting of new areas and in improvements to the existing lighting.

Contracts Closed

THE BRITISH THOMSON-HOUSTON COMPANY, LTD.—*Great Northern Railway (Ireland)*: For the supply of Mazda Lamps for the twelve months ending December, 1938.

SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD.—*Salford Corporation*: For the twelve months' supply of Siemens Electric Traction Lamps.